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COMPETITIVE EFFECTS OF THE PROPOSED LEVEL 3 COMMUNICATIONS-GLOBAL CROSSING LIMITED TRANSACTION*

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by

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1. INTRODUCTION AND SUMMARY

The proposed acquisition of Global Crossing Limited (Global Crossing) by Level 3 Communications, Inc. (Level 3) will combine the resources, assets, and customer bases of two of the largest - and by most measures the two largest - Tier 1 Internet backbone providers (IBPs)[1] in the world. In its analysis of past transactions in this market, such as the WorldCom/MCI transaction,[2] the Commission has recognized that horizontal combinations in this market pose an extra risk to competition compared to horizontal combinations in most markets because of the network effects in this market created by the fact that users of the Internet value being connected to all other users of the Internet. IBPs must interconnect with one another in order to provide their customers (i.e., ISPs, content providers) with access to all other customers.[3] If an individual IBP

[1] Tier 1 Internet backbone providers operate global networks that carry Internet traffic, interconnect with one another at numerous locations around the globe and generally interconnect with one another on a settlement-free basis. The "customers" of Tier 1 backbones are primarily ISPs and content providers. There are also some smaller backbones with more limited networks called Tier 2 or Tier 3 backbones. These smaller backbones are not important for the purposes of this study and, unless otherwise indicated, I will use the term "IBP" to refer to Tier 1 Internet backbone providers.

[2] *See* the comments of XO Communications, LLC (XO) which this study is attached to for a review of previous cases considered by the Commission and its conclusions. *See Comments of XO Communications, LLC, In the Matter of Global Crossing Limited and Level 3 Communications, Inc., Application for Consent to Transfer Control of Authority to Provide Global Facilities-Based And Global Resale International Telecommunications Services and of Domestic Common Carrier Transmission Lines, Pursuant to Section 214 of the Communications Act as Amended, ("XO Comments"),* IB Docket No. 11-78, July 11, 2011, Section D1.

[3] Interconnection between two IBPs is usually referred to as "peering." In a peering relationship each IBP agrees to accept all traffic from the other IBP that terminates with its own customers. While most interconnection between the IBPs currently occurs on a settlement free basis, there are limited exceptions. A customer of an IBP is generally referred to as purchasing "transit" from the IBP.

provider becomes too large relative to other providers, it may have the incentive to either degrade interconnection[4] and/or charge other IBPs for interconnection, with the result that the market may tip to the dominant provider. Thus mergers that create a single IBP that is disproportionately large or dominant relative to other IBPs create a particular risk to competition. Antitrust agencies in both the United States and Europe have also recognized this issue and acted upon it.[5] Finally, this issue has also been noted and discussed in the academic economics literature.[6]

In the this study I use publicly available data from Renesys[7] (a provider of Internet-related data) and private data made available to me by XO Communications, LLC (XO) to present three different calculations of the effect of the proposed transaction on economically relevant measures of market concentration, firm size and economic dominance. All three calculations support the same conclusion. Namely the effect of the transaction will be to create a dominant firm that is

[4] Note that "degrading interconnection" may take the form of an IBP taking affirmative actions to lower the quality of interconnection below its existing level but may also take the form of an IBP refusing to participate in or discouraging cooperative industry ventures designed to improve the quality of interconnection between IBPs.

[5] *See XO Comments*, Section D1 for a review of previous cases considered by the DOJ and European antitrust authorities and their conclusions.

[6] *See*, for example, Paul Milgrom, Bridger Mitchell and Padmanabban Srinagesh (2000), "Competitive Effects of Internet Peering Policies," in *The Internet UpHeaval*, edited by Ingo Vogelsang and Benjamin Compaine, Cambridge: MIT Press, 175-195; Jacques Cremer, Patrick Rey, and Jean Tirole (2000), "Connectivity in the Commercial Internet," *The Journal of Industrial Economics*, 48(4), 433-472; and Stanley Besen, Paul Milgrom, Bridger Mitchell, and Padmanabhan Srinagesh (2001), "Advances in Routing Technologies and Internet Peering Agreements," *American Economic Review Papers and Proceedings*, 91(2), 292-296.

[7] *See* www.renesys.com.

disproportionately large relative to other firms in the market and will thus create a danger of tipping. This reduction in competition between IBPs will result in higher prices and reduced innovation.

The study is organized as follows. Section 2 uses two different methods to calculate the effect of the transaction on market shares of traffic. Section 3 calculates the effect of the transaction on the share of Internet addresses served by various providers. Finally, Section 4 draws a brief conclusion.

2. THE EFFECT OF THE TRANSACTION ON SHARES OF TRAFFIC

A. Introduction

A problem with assessing the competitive effects of transactions between IBPs, which the Commission itself has noted in its analysis of previous transactions,[8] is that industry data on traffic flows or revenues that could be used to calculate market shares is closely guarded and is generally not publicly available. In this section I will present two different methods of estimating market shares of traffic and the effect of the transaction on these shares using two different data sources. The first method is based on using publicly available data on the share of Internet addresses served by various IBPs. The second method is based on using private data from XO on the amount of traffic it exchanges with various IBPs. As will be seen, the two different methods yield very

[8] "As a preliminary matter, we note that no complete and reliable data sources are available to measure relative shares of Internet backbone providers." *See Memorandum Opinion and Order, In the Matter of Verizon Communications Inc., and MCI Inc. Applications for* Approval *of Transfer of Control*, WC Docket No. 05-75, October 31, 2005, at para. 123.

similar qualitative results. Namely, the transaction will combine the two largest IBPs in the industry and result in a provider that is significantly and disproportionately larger than any other provider in the industry.

B. Method #1: Using Renesys Data on Share of Internet Addresses Served

While data of traffic flows and revenue is generally not available, data on the Internet addresses or routes served by different ISPs must necessarily be publicly available from the routing tables that IBPs use to determine where to send traffic. Renesys is a provider of Internet-related data and information that collects this data and makes it publicly available.[9] This data can be used to estimate market shares of traffic.

A simple example can be used to explain the method. Suppose that there are only two IBPs. Suppose that IBP #1 serves 80% of all Internet addresses and IBP #2 serves 40% of all Internet addresses. (Note that the shares will generally sum to more that 100% since some customers multi-home. In this example, the shares sum to 120%.) These can be converted to market shares that sum to 100% by calculating each of the above shares as a percentage of the total that they sum to. This yields market shares as follows.

[9] The specific data used in this study was provided by Renesys in blog entries on the Level 3/Global Crossing transaction and Qwest/Savvis transaction. *See* Renesys Blog, www.renesys.com/blog/, "Level Crossing," April 14, 2011 and "Quavis: The Battle for Second," April 29, 2011. Renesys provides a more comprehensive and detailed discussion of its methodology for calculating shares of Internet addresses served at www.renesys.com/tech/presentations/pdf/monog2.pdf.

Market share of IBP #1	=	80 x 100%/120
	=	66.7%
Market share of IBP #2	=	40 x 100%/120
	=	33.3%

The shares calculated in this manner will be reasonable approximations of each firm's market share of traffic if each firm's traffic is relatively proportional to the number of Internet addresses it serves.

Table 1 presents the Renesys data on shares of Internet addresses served for the top 10 IBPs and the estimated market shares of traffic calculated based on this data calculated as described above. The first column of Table 1 provides the name of each IBP. The second column provides the Renesys data on the share of Internet addresses served by each IBP. Note that theses shares sum to 200%. Therefore market shares of traffic are calculated by dividing the Renesys shares by 2. The third column of Table 1 presents these results.

According to the results in Table 1, Level 3 and Global Crossing are the two largest IBPs with, respectively, 20% and 15% of the market. Therefore the merged firm would have a market share of 35% which is three times the share of the next largest firm. Today, prior to the transaction, the largest firm is only 1.33 times as large as the next largest firm. Therefore the effect of the transaction will be to create a new firm that is disproportionately larger than all other firms, which in turn creates a danger of tipping in this market.

The effect of the transaction on the HHI index would be to increase it from 1175 to 1579 for an increase of 404. The DOJ/FTC Horizontal Merger Guidelines define a market with an HHI of between 1500 and 2500 to be moderately concentrated and state the following:

> "Mergers resulting in moderately concentrated markets that involve an increase in the HHI of more than 100 points potentially raise significant competitive concerns and often warrant scrutiny."[10]

Thus based on these market shares, the Level 3/Global Crossing transaction belongs to the group of transactions that "raise competitive concerns and often warrant scrutiny." The thresholds that trigger concern are meant for typical markets that do not necessarily exhibit network effects. The fact that there are significant network effects in this market of course increases the competitive risk posed by any increase in concentration.

C. Method #2: Using XO Data on Traffic Exchange with Other IBPs

XO provided me with data on the amount of traffic it exchanges with other IBPs.[11] This data provides an alternate method for estimating market shares of traffic for each IBP.

Once again a simple example can be used to explain the method. Suppose that there are only two IBPs. Suppose that the traffic exchanged with IBP #1 is 150 Gbps and the traffic

[10] *See* U.S. Department of Justice and the Federal Trade Commission, *Horizontal Merger Guidelines*, August 19, 2010 at 19, available at www.ftc.gov/os/2010/08/100819hmg.pdf.

[11] For each IBP, XO provided me with data for a recent month on the amount of the traffic flowing into XO from the IBP and the amount of traffic flowing out of XO to the IBP. Traffic was measured according to the 95th percentile of capacity usage, measured in Gbps (gigabits per second), which is the industry-standard measure of traffic flow. For each IBP, I summed the in and out traffic flows to calculate the total traffic exchanged.

exchanged with IBP #2 is 50 Gbps. These can be converted to market shares that sum to 100% by calculating each of the above amounts as a percentage of the total to which they sum. This yields market shares as follows.

Market share of IBP #1	=	150 x 100%/200
	=	75%
Market share of IBP #2	=	50 x 100%/200
	=	25%

The shares calculated in this manner will be reasonable approximations of each firm's market share of traffic if each firm's total traffic is relatively proportional to the amount of traffic it exchanges with XO.

Table 2 presents the results of this calculation for the top ten IBPs that XO exchanges traffic with, listed from largest to smallest. Note even though XO is filing share data pursuant to confidentiality protections of the FCC's rules, XO is not filing the underlying data on traffic flows between XO and each IBP and the names of the IBPs other than Level 3 and Global Crossing because presentation of this additional data is not necessary for me to demonstrate that market shares calculated according to this alternate method yield the same qualitative conclusion as market shares calculated according to the first method. Namely, Level 3 and Global Crossing are the two largest providers in the market and the transaction will create a new provider that is disproportionately larger than any other provider in the market.

According to the results in Table 2, Level 3 and Global Crossing are the two largest IBPs with, respectively, [START CONFIDENTIAL****END CONFIDENTIAL] %f the market. Therefore the merged firm would have a market share of [START CONFIDENTIAL****END CONFIDENTIAL] which is [START CONFIDENTIAL****END CONFIDENTIAL] times the share of the next largest firm. Today, prior to the transaction, the largest firm is only [START CONFIDENTIAL****END CONFIDENTIAL] times as large as the next largest firm. Therefore the effect of the transaction will be to create a new firm that is disproportionately larger than all other firms, which in turn creates a danger of tipping in this market. Furthermore, the HHI increases from [START CONFIDENTIAL****END CONFIDENTIAL] for an increase of [START CONFIDENTIAL****END CONFIDENTIAL] points. Therefore, as explained above, the transaction falls into the group of transactions that "raise competitive concerns and often warrant scrutiny" according to the DOJ/FTC Horizontal Merger Guidelines.

D. Conclusion

Two very different methods of estimating market shares based on very different types of data yield striking similar qualitative conclusions about the competitive effects of the Level 3/Global Crossing transaction. Namely, Level 3 and Global Crossing are the two largest firms in the market with market shares of respectively of [START CONFIDENTIAL****END CONFIDENTIAL]-20% and 15-[START CONFIDENTIAL****END CONFIDENTIAL] %. The merged firm will have a market share of [START CONFIDENTIAL****END CONFIDENTIAL]-35% and be [START CONFIDENTIAL****END CONFIDENTIAL]-3 times as large as the next largest firm. Therefore the effect of the transaction will be to create a new firm that is disproportionately larger than all other firms, which in turn creates a danger of tipping.

Furthermore, based on changes in the HHI index, the transaction falls into the group of transactions that "raise competitive concerns and often warrant scrutiny" according the DOJ/FTC Horizontal Merger Guidelines, and these concerns should be heightened yet further by the presence of significant network effects in this market.

The fact that two such different methods of estimating market shares based on very different types of data yield such similar qualitative conclusions leads me place a high level of confidence in the veracity of these qualitative conclusions.

3. THE EFFECT OF THE TRANSACTION ON SHARE OF INTERNET ADDRESSES SERVED

A recent development in the Internet marketplace is the growing importance of applications such as streaming video, VOIP, and financial market applications that demand very low levels of latency. This is significant because, even if IBPs make good faith efforts to seamlessly interconnect with one another, the latency of Internet transmissions between two users will generally be lower if both users are customers of the same IBP, than if they are customers of two different IBPs. Thus the greater importance attached to low latency has amplified the advantage that customers receive from being connected to the largest IBP and thus increased the tendency of the market to tip to the largest provider.

In addition to suggesting that the danger of tipping has increased, this recent development also suggests another important metric that can be used to help measure the potential competitive harms created by a merger. This is because a merger will become more problematic to the extent

that it creates a new firm that directly serves a disproportionately large share of customers compared to all other firms relative to the situation that exists before the merger.

Of course the Renesys data on shares of Internet addresses served can be interpreted as providing data on shares of customers served by each IBP prior to the merger. Recall that these shares are presented in the second column of Table 1. In its published analysis of the Level 3/Global Crossing transaction, Renesys also estimates that the merged firm would serve 55% of all Internet addresses.[12] Of course the share of Internet addresses served by other firms will not change because of the transaction.

Therefore after the transaction, the merged firm will serve 55% of all Internet addresses, while the next largest firm will served only 22% of all Internet addresses. Thus the largest firm will serve more than twice as many Internet addresses as the second largest firm. Today, prior to the merger, the largest firm serves only 1.33 times as many Internet addresses as the next largest firm. Therefore, to the extent that there are positive network affects associated with the base of customers that an IBP directly serves (due to reduced latency), the effect of the transaction will be to create a disproportionately dominant firm relative to its rivals.

4. CONCLUSION

As the Commission has previously recognized, a merger between competing IBPs will pose a particular risk to competition if it creates a single provider that is disproportionately larger

[12] Note that the share of Internet addresses served by the merged firm will be less than the sum of the Internet addresses served by each of the merging firms because some customers multi-home with both merging firms.

and more dominant than all other firms in the market, and thus creates a danger of tipping. This study has presented three different calculations of the effect of the proposed Level 3-Global Crossing transaction on economically relevant measures of size, concentration and market dominance. All three calculations yield the same conclusion. Namely, the result of this transaction will be to create a disproportionately larger and more dominant firm than other firms in the market. This reduction in competition between IBPs will result in higher prices and reduced innovation.

TABLE 1

SHARES OF INTERNET ADDRESSES SERVED BY THE TOP 10 IBPS

IBP	Share of Internet Addresses Served	Estimated Market Share Of Traffic
Level 3	40%	20%
Global Crossing	30%	15%
NTT	22%	11%
Sprint	20%	10%
Tinet	16%	8%
Telia	16%	8%
Tata	16%	8%
Verizon	15%	7.5%
?	13%	6.5%
Savvis	12%	6%
Total	200%	100%

Notes:

1. Source of Data on Share of Internet Addresses Served: Renesys Blog, www, renesys.com/blog/, "Level Crossing," April 14, 2011 and "Quavis: The Battle for Second," April 29, 2011. Some of the data was only presented in graphs and the precise values of the data had to be measured from the graphs. Also information about the identity of the ninth largest provider was not published. A value intermediate between the two values for the adjacent firms was chosen.
2. Renesys provides a more detailed and comprehensive discussion of its methodology for calculating shares of internet addresses served at www.renesys.com/tech/presentations/pdf/monog2.pdf.

TABLE 2
CALCULATION OF MARKET SHARES OF TRAFFIC FOR THE TOP 10 IBPS BASED ON RELATIVE TRAFFIC EXCHANGE BETWEEN XO AND IBPS

IBP	**Estimated Market Share of Traffic**
Level 3	[START CONFIDENTIAL****
Global Crossing	****
IBP #3	****
IBP #4	****
IBP #5	****
IBP #6	****
IBP #7	****
IBP #8	****
IBP #9	****
IBP #10	****END CONFIDENTIAL]
Total	100.0%

Notes:

1. Data on total traffic that XO exchanges with each IBP provided by XO.

2. Market shares for each IBP calculated by calculating the traffic XO exchanges with each IBP as a percent of the total traffic that XO exchanges with all ten IBPs.